A GIS Analysis of East Asian Care Gaps in Residential and Assisted Living Facilities in Vancouver, Canada

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Abstract

Residential care and assisted living services provide support to seniors who may not have the ability to live independently. However, East Asian residents often do not have sufficient access to culturally-specific activities, which may result in psychosocial stress and isolation. This study presents a geographic analysis method to evaluate spatial distribution of culturally-tailored senior care facilities in Metro Vancouver. We identify geographical disparities, indicating that many East Asian seniors have poor local access to a culturally-tailored facility. We recommend the use of geographical analysis techniques to improve the analysis and planning for senior care in an increasingly diverse population.

Keywords: GIS, assisted living, long-term care, residential care, East Asian

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Similar to many other countries in the global north, the aging of the Canadian population continues to accelerate due to an aging baby boomer generation with increasing life expectancy (Statistics Canada, 2017a,b). The older population is also becoming more heterogeneous in regions that receive large numbers of immigrants, particularly from Asia, Africa, and South America. According to the 2016 Canadian census, approximately 70% of recent immigrants have settled in major metropolitan cities (e.g., Vancouver, Toronto, and Montreal), and are increasingly settling in ethnically diverse neighborhoods. East Asian (EA) immigrants (persons of Chinese, Japanese, Korean, and/or Taiwanese heritage) and immigrants from the Philippines comprise the largest of newcomer groups to Canada, with China being the most common country of origin. The number of Asian-born immigrants aged 65+ is projected to increase significantly in future cohorts (Carrière, Martel, Légaré, & Picard, 2016).

Coinciding with this demographic shift is an increased demand for residential care (RC), assisted living (AL), and independent living (IL) accommodations (British Columbia Ministry of Health, 2013; Robison, Shugrue, Fortinsky, & Gruman, 2013), including facility care that addresses the unique needs of EA seniors. RC (long-term care/nursing home) provides 24-hour formal nursing care and supervision in a specialized, supportive environment for people who can no longer live in the community due to complex care needs (British Columbia Ministry of Health, 2007). AL residences provide personalized services for independent seniors who require assistance with activities of daily living, including hospitality services, personal assistance, congregate meals, and leisure activities (McGrail et al., 2012). However, a gap exits with respect to RC and AL needs of ethnically diverse Canadians, including the large numbers of recent immigrants to Canada originating from EA countries.

A common misconception is that EA seniors require less care than other seniors due to traditional beliefs, values, and practices associated with filial piety whereby family members are expected to provide care and support (Fang, Malcoe, Sixsmith, Wong, & Callender, 2015). However, according to Wong et al. (2005), some EA seniors prefer to seek assistance through organizations rather than enlist the help of family members, especially those living in more urban communities. As chronic conditions progress and the burden of care becomes too high for family members, EA seniors seek support from formal care services (Chang & Hirdes, 2015; Cheng, 2005), including RC and AL options. EA seniors prefer to live in a care home that is culturally-tailored to their needs (Cheng, 2005). According to Koehn (2006), ethnocultural seniors "may need residential care as their health fails, but they do not want to go into facilities unless they can speak their own language, eat their own food, and observe their religion (pg. 4)." These specific needs are not addressed in most care facilities that cater to Western beliefs and practices. Unmet sociocultural needs can lead to psychosocial stress and social isolation among EA seniors who require care (Chang & Hirdes, 2015; Cheng 2005; Social Policy Division, City of Vancouver, 2010).

Nevertheless, culturally-tailored healthcare provision is limited and lacking in major Canadian cities (Koehn, Neysmith, Kobayashi, & Khamisa, 2013). While agencies offering services to ethnocultural minority seniors in languages other than English are increasing, there remains an unmet need (United Way of the Lower Mainland (UWLM), 2008); and government agencies have been criticized for their lack of effort in integrating cultural competence within essential senior services, such as home and community-based supports and RC (Social Policy Division, City of Vancouver, 2010). Despite reports of unmet long-term care need, there has been no systematic analysis of the supply and demand RC and AL facilities that offer ethnocultural-tailored programs and services. As these two types of accommodation provide a higher level of

care than independent living facilities, they are of particular importance for understanding care gaps. The aim of this study is to examine the supply and demand of ethnoculturally-accommodating RC and AL facilities in Metro Vancouver from a geographic perspective.

Study Area

In 2016, Metro Vancouver was home to approximately 2.5 million residents (Statistics Canada, 2017c). Similar to other major Canadian cities, Metro Vancouver has had a significant influx of recent immigrants from East Asia and South Asia (Carrière, Martel, Légaré, & Picard, 2016; Social Policy Division, City of Vancouver, 2010). EA residents comprise the second largest ethnic group in Vancouver, with over 26% of newcomers to British Columbia (BC) originating from Mainland China (UWLM, 2008). Although the vast majority of services and RC in Metro Vancouver has been cited as not being culturally-sensitive to the needs of EA seniors (Cheng, 2005; Lai, 2008), there are a few exceptions. SUCCESS, a multicultural multiservice agency based in the City of Vancouver, operates a residential care home in Downtown Vancouver, the Simon K.Y Lee Care Home, a 113-bed home that provides a continuum of culturally-tailored care for EA seniors, as well as two assisted living facilities, Harmony House and Austin Harris Residence (SUCCESS, 2016). These facilities provide culturally-diverse programming, such as serving non-Western foods, facilitating ethnocultural games and activities, religious ceremonies, and day-trips to sites of cultural relevance, and employing multilingual staff. Despite the availability of these services, the degree to which the ethnocultural needs of EA seniors living in RC and AL are being met in the broader Vancouver Metro area is unknown.

Although there exists a number of RC and AL beds in Metro Vancouver, whether these are culturally-tailored for specific ethnocultural groups is largely unknown, as is knowledge of the number of EA seniors currently residing in these facilities. In this study, we utilize a

geographically explicit quantitative method to measure the supply and demand of EA seniors and their local access to RC and AL facilities that offer culturally-tailored programs. By highlighting regions of high and low service ratios, we identify the gaps as well as opportunities to improve equitable service provision in RC and AL for seniors.

Data and Methods

This study uses an adaptation of a spatial-epidemiological approach (Elliot & Wartenberg 2004) to map services (care facilities) and populations of interest (EA and non-EA seniors), compute local access rates, and identify geographic patterns and disparities throughout the study area (Metro Vancouver).

Care Facilities

Focusing on 8 municipalities in Metro Vancouver (City of Vancouver, City of Richmond, Burnaby, New Westminster, City of Surrey, White Rock, Coquitlam, and Port Moody), we derived a list of all RC (N=66) and AL (N=45) facilities for persons aged 65+. These data were drawn from the Office of the Seniors Advocate British Columbia Residential Care Facilities Quick Facts Directory (Office of the Seniors Advocate, 2017) and the Province of British Columbia Assisted Living Registrar (Government of British Columbia, 2017). Staff from all facilities were contacted via e-mail or telephone in October 2016 and asked to complete a questionnaire. Facility staff were asked to indicate the number of EA residents (based on knowledge of the residents' ethnic identity, language, or surname) and to describe the culturally-specific EA services or programs (e.g., serving cultural foods, facilitating religious ceremonies, or hosting day-trips to sites of cultural relevance). The explicit focus on questioning participants about their EA programming enabled the categorization of facilities as either offering or not

offering EA programming (1 vs. 0). Ethics approval was obtained from a University Ethics Review Board. Staff and facility names have been removed to protect identities.

Survey data were qualitatively evaluated to determine which facilities offered a sufficient degree of EA programming. Facilities that reported offering no specific programming for EA residents or reported offering only yoga or tai chi on a weekly basis or less were categorized as facilities that do not offer EA programming. In comparison, any facility that offered more programming than this, including exercise (e.g., tai chi twice a week), music (e.g., music therapy and songbook in Cantonese), food (e.g., congee and dim sum served), game (e.g., daily Mahjong), or holiday (e.g., Chinese New Year) programming, or offered programs in EA languages, were categorized as facilities that do offer EA programming. The initial categorization assessment was independently conducted by two researchers and any disagreements (of which there were very few) were discussed until all facilities were coded as either offering culturally-tailored programming for EA residents, or not. Each facility location in the study area was mapped using geographic information systems (GIS), and maps displaying facilities by type of care (RC or AL), resident population, the percentage of residents who are EA, and facilities that provide culturally-tailored services or programs were created.

Census Data

Using data from the 2011 census (Statistics Canada, 2015), service ratios of the number of beds per 1000 seniors were derived. For each census tract (approximately 2500-8000 residents, the size of a small neighborhood), we recorded the total number of residents (as of April 2011) and the number of residents by 5-year age groups, categorized by mother tongue. Individuals with a mother tongue from present-day Korea, Japan, China, Taiwan, or the Philippines were categorized as EA (30 language groups), and all remaining individuals were categorized as non-EA. We included persons from the Philippines since they also have high rates of immigration to

Vancouver, and are similar in culture to the traditional EA group. Mother tongue was selected for two reasons: it serves as the most reliable proxy for ethnicity in the 2011 census (ethnicity was not reliably recorded in that year), and it is more likely to represent demand for culturally-specific services and programs than ethnicity (i.e., many individuals who are of EA descent do not speak an EA language or participate in cultural activities from the region). Given the fluidity of the term *ethnicity* (both as a definition of cultural-linguistic engagement and as a problematic metric), mother tongue serves as a more reliable and appropriate variable for enumerating subpopulations (Rezai et al., 2013). Associations between residence in facilities with and without EA programming were statistically assessed using Mantel-Haenszel's Chi-square, computed using WinPepi v.11.65.

To derive EA and non-EA population estimates for adults aged 65+ and 75+, we extrapolated trends in age-specific mortality rates (ASMR) for the study area. ASMR were acquired from British Columbia Vital Statistics (BC Stats, 2017) for the years 2008 to 2012, to which we fit a moving-average linear model to derive age-specific 5-year survival rates for each year from May 2011 to May 2016, which were cross-validated against provincial estimates published by Statistics Canada (2015). The resulting survival rates were then applied to each cohort from the 2011 census (EA and non-EA aged 60+ and 70+) to produce population counts for May 2016 (EA and non-EA aged 65+ and 75+). The combined total population of adults aged 65+ and 75+ were validated against preliminary results from the 2016 census, including immigration/emigration estimates published by BC Stats (2017). We then mapped the resulting cohort estimates for the study area, and removed all geographic areas that were uninhabited as of mid-2016.

Service Ratios

To quantify and map the provision of beds across the study area, service ratios were calculated: the number of residents as a percentage of the total EA or non-EA population aged 65+ or 75+ (e.g., 7.9% of all EA persons aged 75+ in our study area are residents of a RC or AL facility). We calculated two types of service ratios: global service ratios (which include the entire population throughout the study area) and local service ratios (which include only the population within 2 km of a RC or AL facility). The global service ratios provided a measure of coverage across the entire study area, while the local service ratios enabled us to identify geographic variations in RC and AL, and identify populations and neighborhoods with unmet demands.

Global residency rates were calculated using total census counts as the denominators (EA and non-EA, aged 65+ and 75+, for a total of 4 sub-groups), and the number of EA and non-EA residents in facilities offering culturally-tailored programs and services as the numerators. For example, the global EA 65+ residency rate equals the number of EA residents in a facility divided by the total EA population ages 65+ in the study area. These results were cross-checked against estimates and statistically evaluated where appropriate by computing odds ratios with 95% confidence intervals (calculated using Fisher's exact method and confirmed with Wald's and Cornfield's tests).

The calculation of local rates used GIS to calculate the geometric centers (centroids) of each census tract in the study area. We then computed the shortest walking distance from the facility to each census tract center, following the road/sidewalk network (DMTI Spatial, 2016). As shown in Figure 1, we excluded any census tracts with a centroid more than 2 km from a facility. We selected a 2 km threshold for four reasons: it approximates the radius of the average demographically heterogeneous cluster of census tracts in the study area (from the census tract centroid to the heuristically-estimated mean outer boundary of all neighboring census tracts with a similar age- and ethnic-population distribution); it represents an approximate maximum

walking distance and proximate driving distance that would be a reasonable expectation for social/familial contact, after adjusting for the standard error of residual distances for all census tracts (e.g., the remaining 400 meters from the facility to the centroid of census tract D in Figure 1); and it provided a stable result during preliminary sensitivity analyses, during which time various threshold distances were tested; and it approximates the size of the average neighborhood in the study area. All census tracts whose centroid is within 2 km walking distance from a facility were therefore included, and the sum of their EA/non-EA populations aged 65+/75+ were used for computing global access rates (e.g., 88% of the EA population aged 75+ lives within 2 km of a facility). This was repeated for facilities that do and do not offer EA programming.

For each 2 km catchment area, we mapped each facility's total number of beds, and standardized this number by the census population within each catchment area for the non-EA population aged 65+ (all facilities) and the EA population aged 65+ (only facilities that provide EA programming). In order to visualize geographic variations in local access ratios (i.e., the number of beds within 2 km driving distance per capita) for EA and non-EA study populations, these results were spatially interpolated and smoothed using the Inverse Distance Weighting algorithm (parameters: all neighbors within a 2000 meter radius, constrained to road network, using a linear weighting function with a 100 meter cell size) in ArcGIS v.13.

Results

Following categorization by mother tongue, 286,211 persons comprising the total population aged 65+ were included in this analysis, 25% who were classified as EA (Table 1). The EA/non-EA distribution was similar for adults aged 75+. All but 6 of 111 RC and AL facilities in the study area responded to the questionnaire. For these 6 facilities, the number of EA residents was imputed for these non-respondent facilities as the mean proportion of EA residents

from the remainder of the facilities (26.6%). Of the 111 facilities, 36% featured EA programming, constituting 37% of the total 10,843 beds (Table 2).

A significant demographic split was noted between facilities with EA programming and those without; 72% of the total EA resident population resides in RC or AL facilities with EA programming, compared to only 27% of the non-EA resident population (Mantel-Haenszel Chi-square = 1654.9, $p<0.001$). In facilities without EA programming, only 10% of the population is EA; in facilities with EA programming 45% of the resident population is EA (data not shown). Of the total number of beds in RC facilities (N=8,352), 40% are in facilities with EA programming, compared to only 27% of all AL beds (N=2,491). Of the total EA residents in RC (N=1,922), 76% live in facilities with EA programming, compared to only 59% of EA residents in AL (N=586), a statistically significant difference (Mantel-Haenszel Chi-square = 63.08, $p<0.001$).

Among the EA census population in our study area, 3.9% of non-EA persons aged 65+ reside in a facility, compared to 3.5% of the EA population (Table 2). In our study population, an EA adult aged 65+ is 2.5 times more likely to be a resident of a facility with EA programming than a facility without (OR=2.53, 95% CI: 2.31-2.76), while a non-EA senior is 2.7 times more likely to live in a facility without EA programming than a facility with it (OR=2.72, 95% CI: 2.59-2.86). This pattern is stronger for RC, where EA seniors are 5.8 times more likely to live in a facility with EA programming versus one with no EA programming (OR=5.84, 95% CI: 5.10-6.70), while non-EA seniors are 2.4 times more likely to live in a facility without EA programming than a facility with it (OR=2.37, 95% CI: 2.25-2.51). For AL, the odds of an EA senior living in a facility with EA programming is 1.4 times greater than living in a facility without (OR=1.42, 95% CI: 1.20-1.68). For non-EA seniors, the odds of living in an AL facility

without EA programming are 4.7 times greater than living in a facility with such programming (OR=4.72, 95% CI: 4.19-5.33).

Geographically, the distribution of RC and AL facilities are similar, with the greatest concentrations of beds in central Vancouver (Figure 2). Facilities providing EA programming were found to be concentrated in the cities of Vancouver and Richmond, with few located in the suburban communities of Coquitlam, Port Moody, New Westminster, and the City of Surrey, and none in the exurban municipalities of White Rock and Langley.

When mapped, the EA population aged 65+ in the study area exhibits a distinct spatial clustering in the cities of Vancouver and Richmond (darker red areas in Figure 3). This pattern is nearly congruent with the distribution of EA residents in care facilities across the study area, indicated by circle size. Facilities offering EA programming are also distributed such that they are concentrated in areas with a greater EA population.

Data presented in Table 3, indicates some disparities in global access rates. For AL, 76% of EA adults aged 65+ live more than 2 km from a facility with EA programming, suggesting that these seniors may need to relocate outside their immediate neighborhood in the event AL is required. Among non-EA adults aged 65+, only 56% live beyond 2 km of an AL facility. For RC, access is better, with only 48% of the EA populations aged 65+ living more than 2 km from a facility with EA programming, compared to 43% of the non-EA population. These patterns were nearly identical for the EA and non-EA populations aged 75+.

As shown in Figure 4, we observed differences in the availability of local beds between AL and RC facilities, and between EA and non-EA populations. For each area, these maps indicate the number of beds within 2 km (for non-EA and EA facilities, respectively), expressed as a rate of the local census tract population aged 65+ (for non-EA and EA persons, respectively). For both AL and RC facilities, areas with few or no local beds per capita (shown in red) are

located in the suburban peripheries of Vancouver. The local availability of beds in facilities with EA programming are highly concentrated in the urban cores of Vancouver and Richmond, with reduced access for EA senior populations living outside these areas. Despite the large EA population in the City of Richmond, we observe a relatively low number of beds in both AL and RC facilities with EA programming. These patterns were nearly identical for the EA and non-EA populations aged 75+ (data not shown).

Discussion

Given the rapid growth of older, culturally-diverse immigrants in Canada and across the Western world, research involving AL (supportive or independent housing) and RC has redirected its focus towards the limited or lack of culturally-relevant programs and services for ethnocultural residents. Research has demonstrated that a majority of ethnic seniors' desire to live in AL or RC housing that offers programs and services that meet their specific cultural preferences and needs, such as staff who speak their language, food options, leisure activities, and other programs (Koehn, 2006).

This study presents a comprehensive supply-demand geographic analysis of EA and non-EA seniors in Metro Vancouver to determine the need for RC and AL facilities that offer EA programming. Based on 2011 census data, we found that among the total population of seniors aged 65+ and 75+, 25% and 26% were respectively classified as EA based on categorization by mother tongue. These estimates of the older EA population in Metro Vancouver coincide with estimates from previous research (Gee, Kobayashi, & Prus, 2004). Based on prior evidence of a shortage of culturally-appropriate RC and AL service (Koehn, Neysmith, Kobayashi, & Khamisa, 2013; United Way of the Lower Mainland (UWLM), 2008; Social Policy Division, City of Vancouver, 2010), we were able to quantify and map these disparities geographically in Metro

Vancouver. While analyzing the number of seniors aged 75+ provides a helpful estimate of current care needs, we elected to also map the prevalence of seniors aged 65+, in order to provide an indicator of both current and future demand, since the 65+ cohort captures the full range of potential demand for RC and AL facilities.

Furthermore, the proportion of EA seniors aged 65+ in Metro Vancouver provides a metric against which to compare culturally-accommodating RC and AL facility availability. Using data collected or imputed from the 111 RC or AL facilities found in Metro Vancouver, we found that approximately 1 in 3 RC or AL beds were in facilities that offer EA programming, such as traditional foods, games and activities, religious services, multilingual staff, and day-trips to cultural points of interest. This calculation provided an estimate of RC and AL beds located in facilities that have EA programming in the region.

In our calculation of the demographic profile of residents living in RC and AL, we found that in facilities with EA programming, there is a large proportion of EA residents. This suggests that the programming offered in facilities is responsive to the cultural backgrounds of their residents. Nevertheless, 28% of the EA senior population living in RC or AL is in a facility without EA programming. While it is unknown why these 711 EA residents are not living in a facility with EA programming, it is likely due to limited bed availability or personal choice. For instance, although not law in British Columbia, health authorities tend to utilize the 'First Appropriate Bed Policy' whereby prospective residents and family members are instructed that they must accept the first bed that becomes available in a care facility (BC Centre for Elder Advocacy and Support, 2014). While this may be less of an issue for residents in AL, which do not operate using this type of policy, research suggests a notable preference for ethno-specific AL and RC facilities by ethnocultural groups (Mahmood, Chaudhury, Kobayashi, & Valente, 2008).

As such, further research is needed to determine the extent to which EA seniors living in facilities not offering EA programming would prefer to live elsewhere.

The apparent gap in supply of facilities with EA programming was more pronounced in AL than RC facilities. Some potential reasons for AL being less likely to offer EA programming when they have EA residents may be assumptions that AL residents are more autonomous and able to get out to cultural events on their own or do not require culturally-tailored supports within the facility. It may also be a function of how AL and RC facilities are funded, with more funding available for resident programming in RC than in AL. Funding limitations for activity coordinators and tailored programming reduces the likelihood of culturally-relevant events and activities regardless of residents' culturally-specific desires and needs. In addition, since AL facilities have limited government-subsidized units, and costs can range between $1,500 and $4,000 per month, AL residents have a higher average socio-economic status than those in RC facilities (Hawes, Phillips, Rose, Holan, & Sherman, 2003), which may influence preferences for culturally-relevant services.

In our geographic analysis, we found a similar distribution of RC and AL facilities within various communities, with a concentration of both in the City of Vancouver. With respect to facilities that offer EA programming, we found concentrations in the cities of Vancouver and Richmond with lower concentrations in outlying communities, which parallel our findings of concentrations of EA seniors in these areas. This exhibits a distinct geographic pattern, such that the communities located further from the cities of Vancouver and Richmond featured little or no EA programming.

Our examination of global and local access rates indicated that AL facilities offering EA programming were particularly limited, such that EA seniors would have to move out of their immediate neighborhood to a RC or AL facility with EA programming. Indeed, we observed that

approximately 76% of EA seniors live more than 2 km from an AL facility with EA programming. Thus, when EA seniors need to move into an AL residence, they are more likely than non-EA seniors to have to relocate outside of their neighborhoods in order to access these services. While RC facilities that offer EA programming were found to be more accessible to EA seniors, 48% of EA seniors aged 65+ live more than 2 km from a RC facility with EA programming. These findings are particularly pertinent in light of research which suggests that seniors generally prefer to reside in communities of familiarity (Canham et al., 2016; Morris, 2013); and that the disruption of a move can lead to loss of social networks and supports and significant challenges that impact an individual's physical and mental health (Dupuis-Blanchard, Neufeld, & Strang, 2009; Fang, Sixsmith, & Woolrych, under review). Moreover, while services may exist at several locations within the region, a person seeking RC or AL may prefer to remain in their local neighborhood in order to maintain social connections and a sense of place (Fang et al., 2016).

Finally, comparing the local bed availability for the local census tract population aged 65+, we again observed that the total number of RC and AL beds within 2 km was concentrated in the cities of Vancouver and Richmond, and that low or no local access to RC and AL is found outside these urban centers. Moreover, for facilities that offer EA programming in areas with high concentration of EA seniors, such as the City of Richmond, local service ratios are unexpectedly low. These findings align with policy recommendations put forth in the City of Richmond's *2015–2019 Older Adults Services Plan*, that proclaim the need for inclusive and culturally-responsive services and programs (Carlile, 2015). As EA seniors in these outer regions must relocate outside their neighbourhoods to access RC and AL beds in facilities with EA programming, these findings indicate a potential demand for such facilities in these regions outside the City of Vancouver.

This research provides evidence of significant shelter and care gaps for EA seniors living in one major metropolitan locale in Canada that has experienced rapid growth in its immigrant population, particularly visible minority individuals from diverse ethnocultural backgrounds. Community-level differences in the proportion of RC and AL facilities with EA programs and services, as well as the proportion of EA seniors living at a distance from these culturally-tailored shelter and care options, indicate a significant disparity in the provision of care. These gaps tend to be situated in areas further from core urban areas, although these patterns are geographically specific.

While this study presents both a novel method for analyzing local supply and demand of care facilities and geographically-explicit patterns of culturally-specific care provision in a multicultural population, we note several limitations. The method for estimating EA and non-EA populations does not account for immigration to the study area and ethnic differences in mortality rates, resulting in a conservative estimate. However, when cross-checked against preliminary census data from 2016, our estimates were found to be very accurate. Importantly, we used the geometric center of each census track to analyze its population's access to care facilities. While relatively accurate in small areas, this method may have induced greater potential error in outlying regions with large census tracts. While more sophisticated methods do exist, we elected to use this technique to improve study replication and use of the technique by non-expert GIS users. We also elected to use a 2 km geographic buffer to define local residency, although geographic distance is only one of several facets of access. For example, we did not model social connectivity. In addition, this study is limited in the clumping of 30 language groups into a single category of East Asians, as these groups comprise a wide variety of cultural groups. In doing so, these data may provide an overestimation of the facilities that offer culturally appropriate programming. Nevertheless, given the available data, this study offers an initial understanding of

the availability of RC and AL facilities with EA programming in the study region, which was the study's goal. Future analyses should aim to have a more fine-grained understanding of the specific cultural programming offered at different facilities.

Conclusion

To our knowledge, this is the first study to conduct a supply-demand analysis of EA seniors in Metro Vancouver to determine the need for culturally-specific RC and AL facilities. By highlighting regions of high and low service ratios, we were able to identify gaps in access as well as opportunities to improve equity in RC and AL for seniors. Our results clearly indicate geographical inequities in the study area, which in the context of aging and diversification, can be expected to increase without appropriate intervention. For instance, health authorities can improve upon the quality of life for EA residents in their facilities by more closely aligning the programs offered therein to the cultural background of residents. In addition, as EA seniors move into RC and AL facilities outside their neighborhoods, additional resources can be focused on supporting these transitions, which can be particularly challenging for seniors.

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Table 1: Study area population by age group and EA/non-EA mother tongue.

	Age 65+	**Age 75+**
EA Persons	72,181 (25%)	31,784 (26%)
Non-EA Persons	214,030 (75%)	88,241 (74%)
Total Population	**286,211**	**120,025**

Table 2: Facilities by type of care and EA/non-EA resident population, and residency rates (percent of total EA/non-EA census population age 65+ residing in a facility).

		Facilities (column %)	Beds (column %)	EA Residents (column %)	Non-EA Residents (column %)
EA Programming	RC	28	3359	1453	1906
	AL	12	677	344	333
	Total	40 (36%)	4036 (37%)	1797 (72%)	2239 (22%)
	Residency Rate			2.5%	1.0%
No EA Programming	RC	38	4993	469	4524
	AL	33	1814	242	1572
	Total	71 (64%)	6807 (63%)	711 (28%)	6096 (78%)
	Residency Rate			1.0%	2.9%
	Grand Total	111	10843	2508	8335
	Residency Rate			3.5%	3.9%

Table 3: Global access rates. [±]

		AL	RC
EA	Age 65+	55,050 (76.3%)	35,102 (48.6%)
	Age 75+	23,636 (74.4%)	14,354 (45.2%)
Non-EA	Age 65+	120,048 (56.1%)	91,892 (42.9%)
	Age 75+	46,812 (53.0%)	35,559 (40.3%)

[±]Number and proportion of EA and non-EA populations living more than 2 km away from a culturally-tailored facility (for EA population, facilities that offer EA programming; for non-EA population, any facility).